PREPARATION AND UTILIZATION OF UBI FLOUR

By

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UNIVERSITY OF THE PHILIPPINES
DILIMAN, QUEZON CITY
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A Thesis
Submitted to the Faculty
of the Department of Home Economics
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In Partial Fulfillment
of the Requirements for the Degree of
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INTRODUCTION

Ubi (Dioscorea alata) is an edible root crop which can be developed into a big industry. It yeilds as high as 30 pounds of tubers per plant. It is suited to the country's climate and soil because of its high resistance to long period of drought and its preference for sandy loams. However, it is planted only as catch crop to young clearings or as additional crop on ridge ends where other major crops are cultivated.

It is unfortunate that such a good crop as ubi is not better cultivated in a large scale. The reason for this is the small market demand. People seldom buy ubi maybe because they are unaware of the various products that can be made from it. In addition to this, there is the time involved in the preparation of various products using the fresh material. A busy housewife who has many things to do besides the meal preparation would not spend her time going through the long preparation of ubi. Better utilization may be made by converting it into flour.

Drying is a method of preserving foods used throughout the country. It is common to people in the rural areas where fruits, vegetables and other food stuffs are sun-dried. Drying provides a convenient means of storing foods.

In industry dried materials are often converted into flour, especially starchy food like grains and tubers. Ubi, like cassava is rich in starch and can be subjected to drying and powdering. Besides flavor, color should be retained after treatment if ubi is to be acceptable.

The aim of this study is to observe the effect of drying and powdering on the color and flavor of the ubi made into various native delicacies.

REVIEW OF LITERATURE

Ubi belongs to the specie Dioscorea alata. It has a characteristic purple color and flavor which differentiate it from other yams. The local names of Dioscorea alata are as follows: ipoi, luktu (Ifugao); kinampi (Bisaya); ubi (Tagalog, Bohol, Itneg, Iloco, and Bisaya). The varieties are differentiated by the color of the flesh which ranges from white to yellow orange, and red to deep purple. The most popular variety is that which is grown in Bohol, and which has lobed tubers and purple flesh. In Manila this variety is often called Cebu ubi because although grown in Bohol, it reaches Manila through Cebu.(1)

The tubers if carefully harvested and stored may keep long. There are two main precautions to be followed in the storage of fresh ubi. The first is to keep them in a dry place and away from the soil, and the second is to protect them from strong rays of the sun. Cut surfaces are subjected to rot and decay especially if they are kept in moist places. In Ceylon the practice is to cover the cut surface with ash to prevent rotting.(9)

Dioscorea alata is about 21 per cent starch. The high starch content of ubi makes it an excellent staple food in times of scarcity. However it is used only as a native delicacy. This is true in the Philippines and in Java. In the West Indies ubi is more of a staple food than it is in the Philippines. According to the study of Hermano and Sepulveda cited by Brown(1) the purple variety of ubi is a good source of vitamine B. The composition and food value are very similar to potatoes and sweet potatoes. The food value of ubi is given in Table I as reported by P. S. Wester.(8)

Table I

Food Value of Dioscorea alata (ubi)

	Analysis					
Constituents	1 Per Cent	2 Per Cent	3 Per Cent	4 Per Cent	5 Per Cent	6 Per Cent
Water	71.84	75.33	70.62	68.86	67.00	64.10
Ash	1.18	1.34	1.13	0.80	1.12	1.37
Crude fibre	0.67	0.42	0.66	0.74	0.77	1.36
Protein	1.54	2.81	1.43	3.55	1.63	1.95
Fat	0.14	0.70	0.04	0.17	0.32	0.15
Starch	20.48	17.06	24.55	20.67	22.82	27.59
Sugar	0.89	0.71	0.93	0.97	0.79	0.65
Calories per kilogram of food	929	885	1,080	1,023	1,038	1,221

Drying is a cheap, simple, and effective means of preserving foods. Starchy food like grains and tubers may be stored and shipped to far places in the form of flour. The simplest method of drying is sun drying. In industry there are four principal methods of drying food stuffs. The most common method is by passing a current of heated air over the material. This is applied in tunnel, spray, cabinet, and drum dryers. The rate of evaporation of moisture from the material in any type of dryer depends on the nature of the material, size of piece, the arrangement and extent to which the material is exposed to the air current, as well as on the temperature, velocity, and relative humidity of the air. Other factors are the thickness, size, shape, and design of the trays.(6)

Drying of food intended for making flour is generally accomplished by dehydrators which are gas-heated. In Idaho surplus potatoes are dried and converted into flour for baking purpose.(7) Preparation of potato flour is accomplished in two ways. One method is by grinding and bolting the dried, riced material and the other is by drum-drying cooked, peeled potatoes reduced to a slurry. In the former method the potatoes are cooked thoroughly by steaming. The cooked material is passed through a ricing device provided with holes not over 1/2 inch diameter. A suitable ricer is necessary otherwise the strings will stick together as they are extruded to fall into the drying trays. Drying of the material is carried out at 165°F.(3) The drying of riced sweet potatoes at 225°F. using the oven was reported by Felicitas C. Fontanilla.(2) No mention was made on the analysis of moisture content and of the cooking quality of the flour. However various products that may be made from the flour were reported.

According to F. N. Morris(6) color change may be observed during the cooking of the fresh material. This occurs when the material is soaked in the cooking medium.

Drying inactivates enzymes found in the food. The activities of the bacteria, molds, and yeasts are also inhibited by the removal of moisture. Dried starchy foods appear to retain their color, flavor, and aroma even without special storage precaution other than exclusion of moisture.(6)

If destruction of pigment like anthocyanin is ever observed during storage, this may be due to the action of undestroyed enzymes or due to some direct atmospheric oxidation. High moisture content may cause destruction of color if the enzymes are not sufficiently destroyed by cooking. For flour to keep well, moisture should not be more than 15 per cent. Eight per cent is preferable for dried potatoes.(7)

Review of the literature revealed only a few studies done on _ubi_. The studies were mostly on how the plant is cultivated. Literature on the drying and milling of potatoes and sweet potatoes proved helpful as references on the processing of ubi.

APPARATUS AND MATERIALS USED

Cooking the tubers

1 kilogram scale balance
1 tray (13 by 17 1/2 inches)
1 timer
1 pairing knife
50 kilograms of fresh ubi

Drying and milling

1 meat grinder
4 trays (9 by 12 inches)
1 kilogram scale balance
1 timer
1 gas oven (home type)
10 glass jars with covers (38 oz. capacity)
1 electric flour mill (with an 80 mesh sieve)

Moisture content determination

9 bottles with covers (4 oz. capacity)
1 analytical balance
6 weighing bottles with fitted covers
1 electric oven
1 dessicator

Product preparation

1 timer
1 gas oven

1 gram scale balance
2 wooden boards
1 kitchen knife
1 kitchen spoon
1 wooden spoon
1 sauce pan
1 small frying pan
1 set of measuring spoons
2 baking sheets
3 small bowls
1 tray (13 by 17 1/2 inches)
2 small loaf pans
1 steamer
1 half gallon ice cream freezer

Product evaluation

5 trays (9 by 12 inches)
5 sets of cups and saucers
5 teaspoons
5 water glasses
score sheets

PROCEDURE

The ubi that was used throughout the work was obtained from a wholesaler in one of the local markets in Manila. It was taken from a pile of more than a hundred kilograms.

Cooking of the tubers

Amounts of 2,500 and 1,500 grams of the raw material were used in drying. First the tubers were thoroughly washed under running water to remove dirt and adhering soil. Then the clean material was steamed for 45 minutes. After cooking, the skins and spoiled portion of the tubers were removed. The weight of the edible flesh was taken and recorded.

Drying and milling

The cooked ubi was passed through a meat grinder and collected on small trays. Five hundred grams of the material ~~was~~ were placed on each tray and spread evenly to about 1/2 inch thickness. A load of 300 grams was tried in some drying experiments. The trays were then placed in the oven set at 200°F. Drying at 175°F. was also tried. The content of each tray was turned over every 30 minutes and the position of each tray was changed 3 times during the process of drying. This was done to insure uniform drying of the material. The oven that was used had a capacity of four drying trays. Drying was carried out until the ubi was brittle or crisp dry. The time of drying was noted. The dried samples were kept in moisture free bottles with tight covers until there was enough to be used in the preparation of various native delicacies.

Milling of the dried material was accomplished by means of a simple electric flour mill with an 80 mesh sieve. The yield of ubi flour in per cent of the fresh sample is given in Table III. The flour was stored in dry bottles with tight covers.

Moisture content determination

Samples of the flour were weighed in bottles previously brought to constant weight. These were heated in a drying oven at 110°C. (255°F.) Similarly the samples were brought to constant weight. Moisture was calculated in per cent of the original sample (Table II).

Utilization of ubi flour

Various native delicacies were prepared using the ubi flour as the chief ingredient. In order that the quality of the products made with the flour could be evaluated similar products using the fresh ubi were also prepared. The proportion of ingredients was the same for both, except that in products made with fresh ubi water was omitted. Two hundred seventy nine grams of the cooked fresh ubi flesh was used as the approximate equivalent of 84 grams (1/2 cup) of the flour. The amount was calculated on the basis of the amount of moisture lost during drying.

Ubi Flan

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
Evaporated milk	120	1/2 cup
Sugar	182	1 cup
Water	240	1 cup

Order of work

1. Dissolve the sugar in milk and water.

2. Add the ubi flour into the mixture in small amounts, stirring after each addition.

3. Transfer the mixture into a shallow pan and heat over a medium flame with constant stirring until it forms a thick paste (when the mixture sticks to the kitchen spoon and separates from the pan as a mass). Note the time of cooking.

4. Transfer the ubi flan into a buttered platter. Press the surface lightly with wax paper to make it smooth.

Pastillas

The amount of ingredients and procedure for making pastillas are the same as for ubi flan. Pastillas, however, requires cooking to a thicker paste (paste when molded can be cut easily with a knife without sticking). After cooking the paste is flattened on a wooden board to about 1/4 inch thickness. Then it is cut into size of 1/4 inch wide by 2 inches long.

Kalamay na Ubi

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
Pinipig	204	2 cups
Coconut milk	360	1 1/2 cups
Sugar	273	1 1/2 cups
Water	240	1 cup

Order of work

1. Separate the coconut cream for making the *latik*.

2. Make another extraction using enough water to make 1 1/2 cups coconut milk.

3. Dissolve the sugar in the coconut milk and water.

4. Add the *ubi* flour to the mixture in small amounts, stirring after each addition.

5. Heat over a medium flame with constant stirring.

6. When the mixture starts to form a paste, add the *pinipig*.

7. Continue heating with constant stirring until the mixture forms a very heavy paste (can hardly be lifted from the pan).

8. Flatten the *kalamay* to about 1/2 inch thickness on a wooden board lined with banana leaf or wax paper.

9. Cut into pieces about 1 1/2 inches wide by 2 inches long. Place a little *latik* on the center of each piece.

Ubi Drop Cookies

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
All purpose flour	54	1/2 cup
Milk	80	1/3 cup
Sugar	91	1/2 cup
Margarine	111	1/2 cup
Egg	48	1 medium

Order of work

1. Cream the margarine and sugar.
2. Add the egg and mix well.
3. Sift the ubi flour and all purpose flour together.
4. Alternately add the milk and mixed flours in small amounts into the creamed mixture, stirring well after each addition.
5. After all the ingredients have been thoroughly mixed, drop the mixture by teaspoonfuls on an ungreased baking sheet.
6. Bake at 375°F. for 10 minutes.

Ubi Drop Nut Cookies

The proportion of ingredients and the order of work are the same as for plain ubi drop cookies. For variation add chopped cashew nuts into the mixture.

Ubi Ice Cream

	Weight in grams	Approximate measure
Ubi flour	42	1/4 cup
Milk	720	3 cups
Sugar	136	3/4 cup
Vanilla		2 drops

Order of work

1. Combine the milk and sugar.
2. Add the *ubi* flour in small amounts into the liquid mixture, stirring well after each addition.
3. Cook the mixture for 2 minutes, stirring while heating.
4. Allow to cool and then add the vanilla.
5. Transfer the cooked mixture into the ice cream freezer.
6. Freeze the mixture using a 1:8 proportion of salt to ice.
7. When ready, keep the frozen mixture in a freezer for 24 hours to ripen.

Fried Ubi Drops

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
Milk	60	1/4 cup
Egg	49	1 medium
Salt		to taste
Sugar		3/4 cup

Order of work

1. Combine the egg, milk, and ubi flour in a small bowl and mix well. Add salt to taste.

2. Mold the thick paste into the desired shape.

3. Fry in deep fat at 300°F. for 3 minutes.

4. Prepare the sirup for coating the fried drops as follows:

   (a) Dissolve the sugar in 1/4 cup of water and bring to a boil over low flame.

   (b) When the sirup has thickened to about the soft ball stage, dip crisp fried drops into the sirup to form a coating.

   (c) Cool and allow the coating to dry.

Ubi Pudding

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
Evaporated milk	120	1/2 cup
Sugar	91	1/2 cup
Egg	49	1 medium
Water	60	1/4 cup
Raisins	10	

Order of work

1. Beat the egg slightly in a small bowl.
2. Add the milk, sugar, and water to the beaten egg.
3. Add the ubi flour in small amounts, stirring the mixture after each addition.
4. Transfer the mixture into a small loaf pan lined with wax paper.
5. Drop the raisins on the surface of the mixture.
6. Cover the pan with wax paper and steam for 30 minutes.

Ubi Puto

	Weight in grams	Approximate measure
Ubi flour	84	1/2 cup
Evaporated milk	60	1/4 cup
Sugar	91	1/2 cup
Baking powder	9	1 tablespoon
Water	60	1/4 cup

Order of work

1. Sift the ubi flour and the baking powder together.
2. Combine the milk, water, and sugar in a small bowl.
3. Add the sifted flour into the liquid mixture in small amounts, stirring well after each addition.
4. Transfer the mixture into a small loaf pan and cover with wax paper.
5. Steam for 25 minutes.

Evaluation of the acceptability of products made from ubi flour

Five judges were selected to evaluate the products twice a week. Each time the judges were presented two or three samples and a score sheet.

To evaluate ubi flan, pastillas, kalamay, ubi pudding, and ubi puto made with ubi flour, a corresponding product made with fresh ubi was taken as reference standard. The products were evaluated for color, flavor, texture, and odor characteristics. The color was judged as bright, dark, dull, muddy, or light purple, and the texture as fine, smooth, coarse, crumbly, soft, medium-hard, hard, pasty, or sticky. Flavor was characterized as strong, slight, pleasing, or no ubi flavor, and similarly for aroma.

For acceptability evaluation, points were given to determine whether the product was acceptable or not. The scale was as follows:

Very good	6 points
Good	5 points
Fairly good	4 points
Fair	3 points
Rather poor	2 points
Poor	1 point
Very poor	0

RESULTS AND DISCUSSION

Discoloration of ubi

Discoloration is a problem in making ubi flour. The fresh tuber when peeled or cut immediately turns brown. Contact of the raw flesh with metal like iron hastens browning even more. Lathrop as cited by Belle Lowe(4) states that iron produces a dull brownish discoloration of anthocyanin. There are also some oxidizing enzymes that act on tannin and cause darkening of peeled or cut fresh material. It was observed that drying should follow promptly after cooking. Otherwise discoloration of the cooked ubi was observed as early as the second day of storage. It was also observed that portions which were not completely cooked discolored when exposed to the air.

Steaming is an effective method of cooking the ubi. Leaching of purple color, liable to occur if the materials are soaked in the cooking liquid is prevented. By steaming the average time of cooking 200 to 500 grams of tubers is about 45 minutes. The time of cooking is affected principally by the size of the tuber.

Rate of drying

Passing the ubi through a meat grinder increases the surface area of the material exposed to the heated air. This increases rate of drying.

As much as possible the conditions affecting the rate of drying were controlled, but due to lack of necessary facilities, humidity in the drying chamber was not controlled. However the process that was used seemed effective for making *ubi* flour. It was observed that the rate of drying was affected by the weight of the tray load and the temperature of the circulating air. A load of 500 grams had an average drying time of about 3 hours and 45 minutes at 175°F. At the same temperature a load of 300 grams needed only 3 hours and 2 minutes. By elevating the temperature to 200°F., a load of 500 grams dried within 3 hours and 32 minutes. At 200°F. however, there was slight scorching of the surface of the material. Raising the temperature from 175°F. to 200°F. produced little difference on the rate of drying but reduced the quality of the flour.

Keeping quality of ubi flour

In a study by Lukton and co-workers(5), they observed that anthocyanin in solution and fruit juices is unstable in an atmosphere of oxygen. In the experiment, however, *ubi* flour stored for 3 months showed no noticeable change in color. Probably the low moisture content of the flour lent stability to the product. The moisture content of 9 samples tested had an average of 8.29 per cent (Table II).

Yield of flour from fresh ubi

In Table III is presented the changes in weight of the *ubi* during the different stages of drying and the approximate yield of flour in per cent of the fresh sample. It may be noted that there is a difference in weight between the dried material and the flour. The cloth bag which received the flour from the mill fitted the machine poorly and allowed some flour to escape through it. As the flour came out of the machine enough pressure was exerted to allow some of the flour to escape from the tiny holes of the cloth and the sides of the receiver.

Table II

Moisture Content of the *Ubi* Flour

Sample	Weight in grams of sample		Loss in weight (gram)	Per cent moisture
	Before drying	After drying		
1	1.1589	1.0526	0.1063	9.17
2	1.1618	1.0767	0.1051	8.89
3	1.1079	1.0106	0.0973	8.82
4	1.0678	0.9834	0.0844	8.90
5	1.1244	1.0259	0.0985	8.76
6	1.0791	0.9954	0.0837	7.75
7	1.3671	1.2714	0.0960	7.02
8	1.2111	1.1334	0.0773	6.39
9	1.109.	1.0113	0.0978	8.81
Average				8.29

Table III

Yield of Flour in Per Cent of Fresh *Ubi*

Fresh *ubi* (grams)	Weight in grams of:			Flour in per cent of fresh *ubi*
	Edible flesh	Dried *ubi*	*Ubi* flour	
2,500	1,900	630	583	23.32
2,500	1,900	630	580	23.20
2,500	2,050	650	580	23.20
2,500	1,950	640	585	23.40
2,500	2,100	610	585	23.40
1,500	1,260	350	340	22.66
1,500	1,275	360	345	23.00
1,500	1,300	360	345	23.00
1,500	1,300	360	340	23.66
Average				23.24

Subjective evaluation of products made from ubi flour

Different native products were prepared from *ubi* flour in order to test its cooking quality. The standards of reference were similar products made from fresh *ubi*. Based on the moisture lost during drying, which was found to be 70.05 per cent, the equivalent of 84 grams (1/2 cup) of flour was found to be 279 grams of cooked edible flesh.

Data on the evaluation of color, flavor, texture, and odor are presented in Table IV. The judges found the products made with *ubi* flour almost comparable in color and flavor with the corresponding products made with the fresh material. Most of the products made with the flour had better texture than those made with the fresh *ubi*.

Most of the products had pleasing purple colors except the *ubi puto* and the fried *ubi* drops. The *ubi flan* and the *kalamay*, made with the flour and the fresh *ubi*, both had bright purple color. The judges recorded the *pastillas*, drop cookies, pudding, and ice cream as having a light purple color. The *puto* made with the fresh *ubi* was muddy purple while the one made with the flour was greenish blue. The baking powder residue, being alkaline, might have affected the pigment. The browning of the fried *ubi* drops was due to the effect of frying.

Products which had pleasing colors were found to have a pleasing *ubi* flavor, especially the ice cream which was well liked by the judges. Two out of five judges said that the flavor of the *ubi puto* and the fried *ubi* drops was slightly acceptable, however, the rest did not like the flavor. The poor color of the products might have influenced the judges' evaluation.

The judges found the products made with fresh *ubi* to have a few coarse particles. The *kalamay* made with the fresh *ubi* and the flour was slightly sticky, however, this did not render the product unacceptable. The *puto* made

T A B L E I V

Results of the Evaluation of the Palatability Qualities of *Ubi* Products

		Ubi Flan	Pastillas	*Ubi* Drop Cookies	*Ubi* Drop Nut Cookies	Kalamay	*Ubi* Pudding	*Ubi* Ice Cream	*Ubi* Puto	Fried *Ubi* Drops
Fresh Sample	Color	bright purple	light purple			dark purple	light purple		muddy purple	
	Texture	few coarse particles	few coarse particles			sticky	fine, soft		fine, moist	
	Flavor	pleasing flavor *ubi*	pleasing flavor *ubi*			pleasing *ubi* flavor	distinct *ubi* flavor		distinct *ubi* flavor	
	Aroma	strong *ubi* odor	slight *ubi* odor				with *ubi* odor		slight *ubi* flavor	
Flour	Color	bright purple	light purple	light purple	light purple	bright purple	purple	light purple	greenish purple	brown on surface dark purple inside
	Texture	smooth, fine	smooth, fine	smooth, fine	smooth, fine	sticky	fine, stiff	smooth, fine	fine, crumbly	slightly coarse
	Flavor	pleasing flavor *ubi*	pleasing *ubi* flavor	distinct *ubi* flavor	slight *ubi* flavor	pleasing *ubi* flavor	distinct *ubi* flavor	distinct *ubi* flavor	slight *ubi* flavor	slight *ubi* flavor
	Aroma	pleasing *ubi* odor	slight *ubi* odor		no *ubi* flavor		with *ubi* flavor		slight *ubi* flavor	no *ubi* odor

made with the flour was crumbly while the one made with the fresh material was rather moist. The fried *ubi* drops were found to be grainy.

Odor of the products did not seem important to the judges. However, those who evaluated it said that *ubi* odor was more distinct in the products made with the fresh *ubi* than those made with the flour. In some products like the *pastillas* and the *kalamay* odor differences were not observed.

The acceptability scores of the different products are presented in Table V. *Ubi* flour ~~gives~~ gave better quality products than the fresh *ubi*. The *pastillas*, *ubi flan*, kalamay, pudding and ice cream made with *ubi* flour were judged as better in flavor and texture than similar products made from the fresh *ubi*. The ice cream was especially well liked by the judges. It received the highest acceptability score of 5.7, a score of 6 indicating a very good product. Seven out of nine products made with *ubi* flour were acceptable with scores ranging from 3.4 (more than fair) to 5.7 (almost very good). According to the evaluation of the judges, the *puto* made with the fresh *ubi* was fair while the one made with the flour was rather poor. The fried *ubi* drops were considered poor products.

Table V

Average Acceptability Scores of the Different Ubi Products

Name of product	Average score in points of the product made with:	
	Fresh ubi	Ubi flour
Ubi Flan	3.9	5.1
Pastillas	4.4	5.6
Ubi Drop Cookies		4.8
Ubi Drop Nut Cookies		5.0
Kalamay	4.0	5.2
Ubi Pudding	2.8	3.4
Ubi Ice Cream		5.7
Ubi Puto	3.0	2.0
Fried Ubi Drops		1.0

Note: The standard scores referred to in this page are as follows: very good = 6; good =5; fairly good = 4; fair = 3; rather poor = 2; poor = 1; very poor = 0.

SUMMARY AND CONCLUSIONS

Summary

The fresh ubi tubers were steamed, passed through a meat grinder, dried, and milled. The cooking qualities of the flour were tested by making it into various native delicacies. The products were evaluated subjectively by five judges for color, flavor, texture and aroma. Similar products made from fresh ubi were taken as standards of reference.

Conclusions

The properties of ubi flour of greatest culinary importance are: (1) color, (2) flavor, and (3) texture.

Color is affected by the method and completeness of cooking the fresh tubers. It is a fact that soluble pigment like anthocyanin leaches out if the material is soaked in water. The enzymes if not completely destroyed by the heat treatment given to the fresh material will cause discoloration. It is important to dry the ubi immediately after cooking to preserve its color. While heating to 200°F. increases the rate of drying, it is safer to dry at 175°F., as scorching of the material occurs at the higher temperature. Scorching of ubi darkens its color. Baking powder which has an alkaline residue also darkens the ubi color.

Drying and milling of ubi do not alter its color and flavor to a great extent. Somehow, milling of the dried ubi improves the texture even more. This makes the products prepared from the flour better in quality than those made from the fresh ubi.

It may be commercially profitable to manufacture ubi flour. If available in such a form, time, labor and fuel could be saved in the preparation of various native ubi delicacies.

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APPENDIX

GLOSSARY OF TERMS

1. Flan. A Spanish term for a custard. The *ubi flan* referred to in this experiment is the dessert made with *ubi*, milk and sugar. It is similar to a pudding.

2. Fresh ubi. Under the product evaluation the term *fresh ubi* refers to the steamed and mashed tuber.

3. Ipoi. A local name of *ubi* in the Ifugao region.

4. Kalamay. A Filipino delicacy usually made with glutinous rice, sugar and coconut milk. In this work the *kalamay* refers to the dessert made with *ubi* flour, roasted and pounded glutinous rice (called pinipig), sugar and coconut milk.

5. Kinampi. A local name of *ubi* in the Bisaya.

6. Latik. The residue which separates when coconut cream is extracted of the oil by the application of heat.

7. Luktu. Local name of *ubi* in the Ifugao region.

8. Pastillas. A confection usually made with fruit pulp and sugar, cooked to a paste and molded. In this work it is made with *ubi*, milk, and sugar.

9. Pinipig. A Tagalog term for roasted and pounded glutinous rice.

10. Puto. A Tagalog term for a steamed rice cake.

11. Ubi. The Tagalog name for the yam belonging to the specie *Dioscorea alata*.

SCORE SHEET

Name ______________________ Date __________

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Product

Reference culinary properties of ubi product

Purple Color	Texture	Ubi Flavor	Ubi Odor
bright	fine	strong	strong
dark	smooth	slight	slight
dull	coarse	pleasing	pleasing
muddy	crumbly	without	without
light	soft		
	medium		
	hard		
	pasty		
	sticky		

General Acceptability Scale	Points
Very good	6
Good	5
Fairly good	4
Fair	3
Rather poor	2
Poor	1
Very poor	0

- -

I. Kindly describe the color, texture, flavor, and odor of the products presented to you using as standard reference the properties listed above.

Color	Texture	Flavor	Odor
1.	1.	1.	1.
2.	2.	2.	2.

II. After evaluating the products for color, texture, flavor, and odor, grade them using the general acceptability scale presented above.

1.
2.

III. Comments:

Weights and Measures

The weights in the recipes of ubi flour, sugar all purpose flour, margarine, and pinipig were taken from the mean weight of one cup each of the materials. The mean weight in grams was obtained by weighing 50 times each material. The weight taken were arranged in order of magnitude. Then each weight was recorded only once to facilitate addition but the frequency of occurence of each weight was noted. The weight was multiplied by the frequency and the products were summed up. The sum of the products was then divided by the total frequency which was 50. The quotient is the mean weight of the material. The computed mean weights of the materials with the corresponding approximate measure were as follows:

	Mean weight in grams	Approximate measure
Ubi flour	169.1	1 cup
Sugar	182.3	1 cup
All Purpose flour	107.6	1 cup
Margarine	222.1	1 cup
Pinipig	102.1	1 cup
Baking powder	9	1 tablespoon

The tables on the following pages show how the mean weight of each material was computed. Nine grams was the weight obtained for one tablespoon of baking powder throughout the weighing process.

Table VI

Mean Weight of 1 Cup of Ubi Flour

Weight in Grams	Frequency	Product (Gram)
168	10	1680
168.5	7	1179.5
169	18	3042
169.5	3	508.5
170	6	1020
170.5	1	170.5
171	4	684
171.5	1	171.5
Total	50	8456.0

Mean weight = 8456 ÷ 50 = 169.1 grams

Table VII

Mean Weight of 1 Cup of All Purpose Flour

Weight in grams	Frequency	Product (Gram)
106.5	3	319.5
107	15	1605.0
107.5	8	860.0
108	20	2160.0
108.5	4	434.0
Total	50	5378.5

Mean weight = 5378.5 ÷ 50 = 107.6 grams

Table VIII

Mean Weight of 1 Cup of Margarine

Weight in Grams	Frequency	Product (Gram)
217	1	217
218	1	218
219	1	219
220	4	880
220.5	5	1102.5
221	3	663
221.5	3	664.5
222	7	1554
222.5	6	1335
223	6	1338
223.5	3	1670.5
224	4	896
224.5	3	673.5
225	3	675
Total	50	11106.0

Mean weight = 11106 ÷ 50 = 222.1 grams

Table IX

Mean Weight of 1 Cup of Sugar

Weight in Grams	Frequency	Product (Gram)
180	6	1080
180.5	1	180.5
181	5	905
181.5	1	181.5
182	19	34588
182.5	4	730
183	7	1281
183.5	2	367
184	4	736
186	1	186
Total	50	9105.0

Mean weight = 9113 ÷ 50 = 182.1 grams

Table X

Mean Weight of 1 Cup of Pinipig

Weight in Grams	Frequency	Product (Gram)
100	5	500
100.5	2	201
101	5	505
101.5	4	406
102	14	1428
102.5	4	410
103	6	618
103.5	3	310.5
104	7	728
Total	50	5106.5

Mean weight = 5106.5 ÷ 50 = 102.1 grams